dent'; for an audience on the back benches, leaving the front benches empty, can not be regarded as encouraging to the speaker. A young page at the service of the president and secretary is an appropriate luxury; he can be waked when messages have to be sent. A lobby into which members can retire for conversation is indispensable for a comfortable meeting; it should not be so near the meeting room that laughing in one drowns speaking in the other. As to the manner of presentation of scientific communications by the speakers, that is too sacred a question for us to enter upon. Individuality must be preserved at all hazards. But if a distinction *could* be drawn between the form in which a problem is prepared for publication and the form in which it is presented orally to a listening audience, and if the effect to be produced upon the audience *could* be duly considered by the speaker, scientific meetings would be even more successful than they are now.

One other practical suggestion may be allowed. It would be an assistance if the local committees would write down the more important results of their experience in a *transmittendum,* to be passed on to their successors. Thus, even if new mistakes were occasionally invented, old mistakes might be more generally avoided, and a greater enjoyment and profit might be secured for all concerned by the gradual removal of various trifling inconveniences and distractions which have no place in well-conducted meetings.

A Fellow of the Association.

SPECIAL ARTICLES.

NOTE ON THE FALLING-TO-PIECES OF THE IONS.

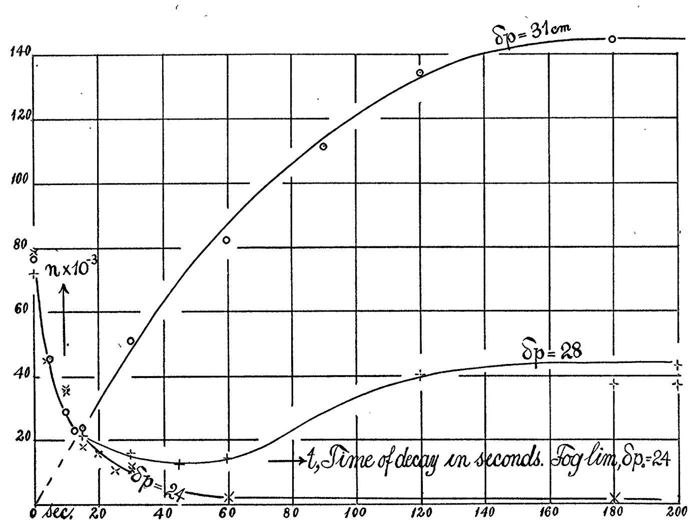
1. The data summarized in the following graphs were obtained by acting in the manner stated, on the dust-free moist air contained within a glass fog chamber, with a sample of weak radium (10,000 $\times$, 10 mg.), sealed in an aluminum tube. This was placed on the outside of the chamber in contact with its walls (.2 to .3 cm. thick), and was then removed suddenly at given intervals before exhaustion. Only very penetrating primary rays (β and γ) are, therefore, in question. The curves show the number of efficient nuclei in thousands per cubic centimeter, observed after the lapses of time shown by the abscissas, and it is supposed that the nuclei are reproduced faster than they can be removed by the exhaustion. In the upper curve the pressure differences applied ($\delta p = 31$) are much above the fog limit of dust-free air, which is below $\delta p_0 = 24$ for the given apparatus. In the lower curve the pressure differences are nearly at the fog limit of dust-free air, while the other curve ($\delta p = 28$) applies for intermediate conditions. The effect of the radiation is, therefore, virtually at least, a coagulation (to use a figurative expression) of the colloidal nuclei of dust-free air, into the aggregates much larger in size representing the ions. Hence in the presence of radium under the given conditions, the number of *efficient nuclei* decreases either because the ions from their size capture all the available moisture more and more fully, or because the colloidal nuclei have actually been aggregated into fewer but larger systems, which will in turn fall apart in the absence of radium. Professor Barus[1] has recently pointed out that inasmuch as the radiation within the fog chamber is largely secondary, and must, therefore, at a given point come from all directions, a corpuscular pressure must exist within, having a tendency to produce agglomeration; and the same results should occur for an easily scattered undulatory radiation. This would explain why the X-rays and ultra-violet light produce fleeting and persistent nuclei alike in kind, except that only the former are ionized.

2. It follows from what has been stated that above the fog limit of dust-free air, the number of efficient nuclei must increase with the removal of radium at a rate which corresponds to the falling to pieces of the ions. The peculiar feature of the results here in question is the manner in which the efficient nucleation decays from the coarser ionized to the finer non-ionized colloidal stages, when the pressure difference is decidedly above the fog limit of air, so that the latter may be recognized. The curves invariably pass through a minimum

[1] *Am. Jour. Sci.,* (4), XX., p. 298, 1905.

when the time after the removal of the radium, *i. e.*, the interval of decay, increases indefinitely.

This minimum, moreover, is very sharp, almost cusp-like, as if one law were passing abruptly into another. Thus below the minimum ($t = 13$ sec. about) the curve for $\delta p = 31$ nearly coincides with the curve for $\delta p = 24$, which is practically independent of the colloidal nuclei of air. The decay may be computed to be of the order of that of ions. After a lapse of 13 seconds the effect of colloidal nuclei is marked for $\delta p = 31$; and even after a lapse of 60 seconds, when the ions



(lower curve) have vanished to a few hundred, the upper curve is only half way on its march toward the asymptote. This shows the remarkable sensitiveness of the method as a test for the presence of ions or of any nuclei larger than the colloidal sizes. Moreover, measurement of the large coronas is relatively easy. Finally, the curve, $\delta p = 31$, if prolonged backwards, would seem to start nearly from the origin; in such a case one would have to picture to oneself a single coagulated particle breaking to pieces in the absence of radiation, into fragments of continually decreasing size, until the débris ultimately numbers 150,000 colloidal nuclei.

The intermediate curve ($\delta p = 28$) also coalesces[2] approximately with the other for lapses of time less than $t = 13$ sec. It has its own minimum, however, and from the lower pressure difference, necessarily its own asymptote at $n = 40{,}000$, since only the coarser order of air nuclei fall within the given limits of condensation in the apparatus used. For the same reason the minimum is lower and later, seeing that the ions are present throughout in relatively greater numbers, as compared with the efficient colloidal nuclei, than was the case at $\delta p = 31$.

3. The curves as a whole have so close a resemblance to the data investigated by Professor Barus for the effect of radium at different *distances* from the fog chamber that the same cause must underlie both series of observations. In the former case (distance effects) any given intensity of ionization between the maximum and the vanishing values may be maintained indefinitely by properly placing the radium tube; in the latter case (decay) all stages are passed through in two or three minutes. Beginning with dust-free non-energized air, the number of efficient nuclei decreases as the number of ions in-

[2] Considered relatively to the wide divergence after $t = 13$ sec. is passed. The coalescence need not be perfect. Small coronas fall out too rapidly for close measurement.

creases (for either or possibly both of the reasons already given) until the condensation takes place wholly on ions. For greater intensities of ionization the number of ions must increase further and hence the efficient nucleation rises again while the curve passes through a minimum.

The curves enable us to make certain interesting comparisons, inasmuch as the same nucleation results from radium decaying for a stated length of time, as results from the action of radium at a certain distance from the line of sight. From the importance of secondary radiation in connection with these observations, such comparisons are probably not simple. The essential feature is the passage of the nucleation through the same stages of variation, whether of size or of number, in both cases, no matter how the given successive intensities of ionization may be produced, or whether they come from within or without.

My thanks are due to Professor Barus for his suggestions and his assistance throughout the research.

LULU B. JOSLIN.

BROWN UNIVERSITY,
PROVIDENCE, R. I.

A LACUSTRINE APHID.

ONE would suppose that submerged aquatic plants might wholly escape the attacks of plant-lice and scale-insects. In the *Feuille des Jeunes Naturalistes,* February, 1905, p. 62, G. Goury describes a supposed scale-insect which he found on a submerged petiole of *Limnanthemum* near Fontainbleau, in France. Unhappily, he put it in an aquarium, and the pond-snails (*Limnœa*) devoured it during the night. This prevented him from giving a description, and although he names it *Lecanium limnanthemi*, we can not resist the observation that all he says about it would apply to a leech egg. However, it is possible for aquatic plants to be attacked by aphids, though these do not inhabit the wholly submerged parts. On October 7 of the present year, my wife and I visited a lake in the immediate vicinity of Boulder, Colorado. The shallow water contained a large quantity of *Myriophyllum verticillatum* L., a submerged plant with only small portions projecting above the surface. We were astonished to find that whenever the plant was not wholly submerged it was infested by aphids, usually in enormous numbers. At first I wondered whether they could have come from the adjacent terrestrial vegetation; but an examination of the narrow-leafed cottonwoods (*Populus*) and cockleburs (*Xanthium*) near by did not reveal any aphids. Closer inspection showed that the insects were thoroughly at home on the *Myriophyllum* and were undergoing all their transformations thereon. We brought some home, fully believing that we had something new, but on looking up the literature it was found impossible to distinguish them from the European (and doubtless circumpolar) *Rhopalosiphum nymphææ* (L.), which is said by Buckton to infest water-lilies (to which it is at times very destructive), *Alisma, Butomus, Potamogeton, Hydrocharis, Lemna,* etc.

The following description, from the Colorado material, is given because the available descriptions are somewhat incomplete; it will also be useful in case any doubt should arise as to the absolute identity of the European and American forms.

Winged Form.—Yellowish-olive, with the head, the chitinous plates of the thorax and the antennæ black; the middle of the abdomen also suffused with black; legs black, pallid only at extreme base; wings clear, stigma very light-yellowish, nervures black; nectaries incrassate, with the apical part black, the basal pallid; lateral edges of abdominal segments with alternate light and dark spots, best seen in balsam mount; antennæ on frontal tubercles; third joint with several sensoria on outer side, fifth with a sensorium in a notch not far from apex; surface of joints finely imbricated. Measurements: length of body about 1½ mm., of wing about 2½ mm.; the rest in μ—nectaries, 255; cauda narrow and fairly long, its width 37; anterior tarsus (excluding claws), 120; antennal joints, (3) 225, (4) 165, (5) 150, (6*a*) 97, (6*b*) 225. Wings with branched vein having distance from first branch to second, 620; second to tip of wing, 225.

Apterous Form.—About 2 mm. long, broad,